

Volume 46 July–December 1982

Philosophical Magazine

First Published in 1798

Physics of Condensed Matter

- A** Defects and Mechanical Properties
- B** Electronic, Optical and Magnetic Properties

EUROPHYSICS JOURNAL

Published by

Taylor & Francis Ltd, 4 John Street, London WC1N 2ET



PHILOSOPHICAL MAGAZINE

Editor:

Professor E. A. DAVIS

Associate Editors:

Professor A. J. FORTY

Dr. P. M. HAZZLEDINE

Dr. M. J. GORINGE

Dr. S. R. ELLIOTT

E. P. S. Editorial Committee:

Professor J. FRIEDEL (Paris)

Professor A. SEËGER (Stuttgart)

Professor U. VALDRÈ (Bologna)

Consultant Editor:

Professor Sir NEVILL MOTT

Book Review Editor:

Dr. E. MARSEGLIA

Subscription Information

USA, Canada and Mexico (air freight): annual subscription (payable in advance), \$520.00; per part \$47.00 (surface post paid). Air freight and mailing in the USA by Publications Expediting Inc., 200 Meacham Avenue, Elmont, New York 11003. Second class postage paid at Jamaica, New York 11431. USA Postmaster: Send address changes to *Philosophical Magazine*, Publications Expediting Inc., 200 Meacham Avenue, Elmont, New York 11003. US subscribers should send order and cheque (in favour of Taylor & Francis Ltd) to Account 04 810 879 Bankers Trust Company, P.O. Box 9137, Church Street Station, New York, N.Y. 10049.

Japan (accelerated surface post): apply to exclusive agents, Kinokuniya Company Ltd, Odakyu West-Shinjuku Building, 47-1 Hatsudai 1-chome, Shibuya-ku, Tokyo 151. Telex 2322535.

FR Germany (surface post): annual subscription (payable in advance), DM 874.00; per part DM 78.00. Subscribers in FR Germany should send order and cheque (in favour of Taylor & Francis Ltd) to Account No. 073 6686, Deutsche Bank AG, BLZ 500 700 10, Postfach 2623, Rossmarkt 18, 6000 Frankfurt/Main 1.

UK and the rest of the world (surface post; accelerated surface post to Australasia; air freight to India): annual subscription (payable in advance), £182.00; per part £17.00 (surface post paid).

Published monthly by Taylor & Francis Ltd, 4 John Street, London WC1N 2ET, UK. Telex 858540.

Printed by Taylor & Francis (Printers) Ltd, Rankine Road, Basingstoke, Hampshire RG24 0PR, UK.

CONTENTS OF VOL. 46 Nos.1-6

NUMBER 1—JULY

PART A

	PAGE
Chemical twinning and ferroelectric domains in LiTaO_3 By L. A. BURSILL and PENG JU LIN.....	1
Displacement vector and energy of a screw dislocation in a Lennard-Jones amorphous solid By P. CHAUDHARI and P. J. STEINHARDT	25
Surface dislocation description of three-dimensional distortions in two-phase systems. A point force normal to a planar interface By K. JAGANNADHAM	31
Incommensurate density modulations in the vanadium-deuterium system By W. PESCH.....	41
Secondary grain boundary dislocations in [001] twist boundaries in MgO. I. Intrinsic structures By C. P. SUN and R. W. BALLUFFI.....	49
Secondary grain boundary dislocations in [001] twist boundaries in MgO. II. Extrinsic structures By C. P. SUN and R. W. BALLUFFI.....	63
Mechanism of oxidation of the crystallographic shear phase Ti_4O_7 By G. J. WOOD, L. A. BURSILL, K. YOSHIDA and Y. YAMADA.....	75
Thermodynamic equilibrium in stressed systems. II. By A. J. B. SPAULL.....	87
Effect of dislocation structure on the flow stress in $\text{Cu-3 at.}\% \text{Al}$ single crystals By T. MORI and H. FUJITA.....	91
Order in two-dimensional binary random arrays By D. R. NELSON, M. RUBINSTEIN and F. SPAEPEN.....	105
Recovery of electrical resistivity and hardness in quenched β-brass By T. H. YOUSSEF and D. SALAMA.....	127
The effect of thin hard coatings on the Hertzian stress field By S. VAN DER ZWAAG and J. E. FIELD	133
An expression for the vacancy-wind effect in diffusion in a binary substitutional alloy By G. E. MURCH	151
Correspondence:	
The geometry of lattice images of steps and dislocations By D. A. SMITH and P. J. GOODHEW.....	161
On the structure of (001) twist boundaries in f.c.c. metals By A. P. SUTTON.....	171
Dislocations in anisotropic media. The interaction energy By J. LOTHE	177

PART B

	PAGE
Characterization of plasma-deposited microcrystalline silicon By Y. MISHIMA, S. MIYAZAKI, M. HIROSE and Y. OSAKA	1
A theory of multiphonon release of trapped electrons in semiconductors By R. A. ABRAM	13
Transient photoconductivity and photo-induced optical absorption in amorphous semiconductors By J. ORENSTEIN, M. A. KASTNER and V. VANINOV	23
The diffusion of holes in undoped amorphous Si:H By B. GOLDSTEIN, J. DRESNER and D. J. SZOSTAK	63
Correspondence:	
Exciton and pair recombination in crystalline and amorphous As₂Se₃ By S. P. DEPINNA and B. C. CAVENETT	71
An anomaly in the infrared absorption spectrum of synthetic diamond By A. T. COLLINS and G. S. WOODS	77
Electrical properties of dislocation lines in silicon By M. JAROS and M. J. KIRTON	85
Book reviews	89

NUMBER 2—AUGUST

PART A

The irradiation-softening phenomenon in high-purity tungsten single crystals with [110] and [100] tensile axes observed by high-voltage electron microscopy By T. TABATA, H. FUJITA and K. ONISHI	181
Neutron diffraction determination of the partial structure factors of molten CuCl By S. EISENBERG, J.-F. JAL, J. DUPUY, P. CHIEUX and W. KNOLL	195
Movement of edge dislocations in KCl by large electric fields By L. COLOMBO, T. KATAOKA and J. C. M. LI	211
Application of the Landau theory to elastic phase transitions By J. K. LIAKOS and G. A. SAUNDERS	217
Foil thickness measurements from convergent-beam diffraction patterns. An experimental assessment of errors By S. M. ALLEN and E. L. HALL	243
The potential and force law between different-size bubbles in soap bubble rafts By L. T. SHI and A. S. ARGON	255

	PAGE
Analysis of plastic flow in an amorphous soap bubble raft by the use of an inter-bubble potential By A. S. ARGON and L. T. SHI	275
Dissociation de dislocations dans un alliage cubique centre (le Fe-40Al) Par N. JUNQUA et J. GRILHÉ	295
Transmission electron microscopy study of experimentally deformed pyrite By C. LEVADE, J. J. COUDERC, J. BRAS and M. FAGOT	307
On the determination of dislocation densities in NaCl single crystals from quadrupolar linewidth measurements By W. H. M. ALSEM and J. TH. M. DE HOSSON	327
Correspondence:	
Electrical resistivity-temperature scale of tungsten By J. N. MUNDY	345
Non-classical diffusion of lithium in lithium borate glasses By H. JAIN and N. L. PETERSON	351

PART B

Hopping conduction in n-type indium antimonide below 1 K By H. TOKUMOTO, R. MANSFIELD and M. J. LEA	93
A crystallographic study of the phase transition at 185 K in Eu_3S_4 By W. WICKELHAUS, A. SIMON, K. W. H. STEVENS, P. J. BROWN and K. R. A. ZIEBECK	115
On the temperature dependence of a.c. conduction in chalcogenide glasses By K. SHIMAKAWA	123
Structural analysis of amorphous V_2O_5 by large-angle X-ray scattering By A. MOSSET, P. LECANTE, J. GALY and J. LIVAGE	137
Theory of photo-capacitance in amorphous silicon MIS structures By J. C. ANDERSON	151
Quenching of luminescence by non-radiative tunnelling By T. M. SEARLE	163
Thermoelectric power, Hall effect and density-of-states measurements on glow-discharge microcrystalline silicon By G. WILLEKE, W. E. SPEAR, D. I. JONES and P. G. LE COMBER	177

NUMBER 3—SEPTEMBER

PART A

PAGE

Pseudoelasticity and slip reversibility in DO₃-ordered Fe–Al single crystals by <i>in situ</i> experiments By L. P. KUBIN, A. FOURDEUX, J. Y. GUEDOU and J. RIEU.....	357
A model relating diameters of atoms in non-spherical voids to unit-cell dimensions, applied to phases with the A15 and Cu₂Mg structures By W. B. PEARSON.....	379
Atomic size and the lattice parameters of solid solutions of Group I to VB solutes in Cu, Ag and Au: a re-examination By W. B. PEARSON.....	387
Point defects and high-temperature creep of non-stoichiometric NaCl-type oxide single crystals. I. NiO By J. CABRERA-CAÑO, A. DOMINGUEZ-RODRIGUEZ, R. MARQUEZ, J. CASTAING and J. PHILIBERT	397
Point defects and high-temperature creep of non-stoichiometric NaCl-type oxide single crystals. II. CoO By A. DOMINGUEZ-RODRIGUEZ, M. SANCHEZ, R. MARQUEZ, J. CASTAING, C. MONTY and J. PHILIBERT	411
Oxygen self-diffusion in NiO single crystals By C. DUBOIS, C. MONTY and J. PHILIBERT	419
Calculation of the scattering from defects using periodic continuation methods By A. R. WILSON and A. E. C. SPARGO	435
The orientation dependence of dislocation slip in NaCl single crystals By W. H. M. ALSEM, J. TH. M. DE HOSSON, H. TAMLER and O. KANERT	451
The mean free path of mobile dislocations in doped NaCl single crystals measured by N.M.R. between room temperature and 300°C By W. H. M. ALSEM, J. TH. M. DE HOSSON, R. MUENTER, H. TAMLER and O. KANERT	469
Anelastic relaxation due to Ti–H complexes in Nb–Ti alloys By G. CANNELLI, R. CANTELLI and M. KOIWA	483
Polarity and inversion twins in ZnSe crystals observed by high-resolution electron microscopy By M. SHIOJIRI, C. KAITO, S. SEKIMOTO and N. NAKAMURA	495
Texture strengthening in warm-rolled cadmium–1% silver alloy By A. H. YEGNESWARAN, K. S. RAMAN and Y. V. R. K. PRASAD	507
A microscopic study of elastic deformation in an oxide layer on a plastically deformed metal By A. J. FORTY	521
Correspondence:	
Production of a large planar array of Lomer–Cottrell locks in silver by controlled mechanical straining By F. MINARI, B. PICHAUD and M. BURLE	531

PART B

PAGE

Estimation of the free energy of charge transfer in molten UO_2 By M. J. GILLAN	191
Electric-field-modulated spectra of orpiment (As_2S_3) near the energy gap By D. REBENSTORFF and G. WEISER	207
Flux pinning by grain boundaries in Pb-Bi alloy films By W. E. YETTER and E. J. KRAMER	221
Thickness dependence of electrical and optical properties and E.S.R. in undoped a-Si:H By S. HASEGAWA and Y. IMAI	239
Factors affecting domain wall mobility in thin ferromagnetic metal films By A. AHARONI and J. P. JAKUBOVICS	253
Correspondence:	
Spin-dependent photoconductivity in undoped a-Si:H By R. A. STREET	273
Book reviews	279

NUMBER 4—OCTOBER

PART A

Time-dependent melting and superheating of lead crystallites By G. D. T. SPILLER	535
Thermodynamic equilibrium in stressed systems. III. General treatment By A. J. B. SPAULL	551
Helical dislocations in α-sulphur single crystals By R. M. HOOPER and J. N. SHERWOOD	559
Computer simulation of tracer diffusion in a concentrated alloy with long-range order By G. E. MURCH	565
Computer simulation of the vacancy-wind effect in a concentrated alloy with long- and short-range order By G. E. MURCH	575
Climb dissociation of $\langle 10\bar{1}0 \rangle$ dislocations in sapphire ($\alpha\text{-Al}_2\text{O}_3$) By D. S. PHILLIPS and J. L. CADDOZ	583
Dislocation loops at twin boundaries in an ion-irradiated austenitic alloy By P. L. LANE and P. J. GOODHEW	597
The influence of solute drag on dislocation creep By B. BURTON	607
Elastic stress fields caused by indenting brittle materials By E. H. YOFFE	617

Influence of aggregation-precipitation state of Eu^{2+} on the hardening behaviour of NaCl single crystals	
By J. J. MARTIN, V. J. HARNESS, E. M. OROZCO, A. A. MENDOZA and J. O. RUBIO	629
Dislocation dipoles and loops in magnesium oxide	
By G. KAMESWARA RAO and A. S. PÂRASNIS	641
The effective bias of tangled dislocations	
By G. W. LEWTHWAITE	653
Détermination des rapports de fréquences de saut de la lacune par électromigration dans les alliages binaires cubiques centrés dilués	
Par Y. SERRUYS et G. BREBEC	661
Molecular dynamics of disordered copper. A comparison of constant-pressure and constant-volume simulations	
By S. W. DE LEEUW, M. DIXON and R. J. ELLIOTT	677
Determination of the thickness of the ferroelectric domain boundary in triglycine sulphate by X-ray topography	
By D. Y. PARPIA	691
On the stress-induced birefringence images of edge dislocations viewed from the side in GaP single crystals	
By K. LÖSCHKE and P. PAUFLER	699

PART B

Theory of muon spin relaxation due to the hopping motion of positive muons in ferromagnets	
By A. SEEGER and P. MONACHESI	283
Screening of the random potential near the Anderson metal-insulator transition	
By J. JÄCKLE	313
Impurity dependence of the viscosity of liquid selenium	
By J. C. PERRON, J. RABIT and J. E. RIALLAND	321
Synchrotron X-radiation topography studies of the magnetization process in $\text{Tb}_{0.27}\text{Dy}_{0.73}\text{Fe}_2$	
By G. F. CLARK, B. K. TANNER and H. T. SAVAGE	331
Calcul de la résistivité et du pouvoir thermoélectrique des alliages en cours de démixtion	
Par P. GUYOT et A. BAUER	345
High-resistivity alloys as highly correlated disordered systems	
By M. I. KATSNELSON and A. S. SHCHERBAKOV	357
Optical gaps from 'mean' bond energy in $\text{Ge}_{1-x}\text{S}_x$ and $\text{Ge}_k\text{Sb}_m\text{S}_n$ non-crystalline solids	
By L. TICHÝ, A. TRÍSKA, Č. BARTA, H. TICHÁ and M. FRUMAR	365
The density of states in amorphous silicon determined by space-charge-limited current measurements	
By K. D. MACKENZIE, P. G. LE COMBER and W. E. SPEAR	377

	PAGE
Electron impact processes in CdF₂:Gd crystals	
By C. PARACCHINI.....	391
Book reviews	407

NUMBER 5—NOVEMBER

PART A

Editorial

H.V.E.M. study of ordering and disordering in Cu₃Au	
By M. Z. HAMEED, R. E. SMALLMAN and M. H. LORETTO	707
Electron damage in Cu₃Au	
By M. Z. HAMEED, R. E. SMALLMAN and M. H. LORETTO	717
Nucleation of voids in materials supersaturated with mobile interstitials, vacancies and divacancies	
By W. G. WOLFER and A. SI-AHMED.....	723
A model for the effect of grain size on the yield stress of metals	
By M. A. MEYERS and E. ASHWORTH.....	737
Motion of a $1/3\langle\bar{1}\bar{1}23\rangle$ screw dislocation in a model h.c.p. lattice	
By Y. MINONISHI, S. ISHIOKA, M. KOIWA and S. MOROZUMI.....	761
Simulation of the (001) plane crack in α-iron employing a new boundary scheme	
By M. MULLINS and M. A. DOKAINISH	771
Computer simulation of surface effects on defect production in tungsten	
By J. H. KINNEY and M. W. GUINAN	789
The relationship between flow stress and dislocation behaviour in [111] aluminium single crystals	
By T. TABATA, H. FUJITA, M.-A. HIRAOKA and S. MIYAKE	801
A calculation of the vibrational entropy of anion Frenkel defects in fluorite crystals	
By V. C. SAHNI and P. W. M. JACOBS.....	817
Specific heat of high-purity solid gallium close to the melting point	
By G. FRITSCH, R. LACHNER, H. DILETTI and E. LÜSCHER	829
Solute and solvent diffusion in Zr-V alloys	
By D. D. PRUTHI and R. P. AGARWALA	841
Atomic structure of the NiSi₂/(111)Si interface	
By D. CHERNS, G. R. ANSTIS, J. L. HUTCHISON and J. C. H. SPENCE ..	849
Correspondence:	
A correlation between solid solubility and tetrahedral radius of III, IV and V group impurities in silicon	
By P. CAPPELLETTI, G. F. CEROFOLINI and G. U. PIGNATEL	863

PART B

PAGE

Editorial

Characterization of iron/oxygen surface reactions by X-ray photoelectron spectroscopy By G. C. ALLEN, P. M. TUCKER and R. K. WILD	411
Properties of hydrogenated amorphous carbon films and the effects of doping By D. I. JONES and A. D. STEWART	423
Dual-beam photoconductivity modulation spectroscopy in a-Si:H By P. D. PERSANS	435
Characterization of radiative recombination in amorphous silicon by optically detected magnetic resonance: Part I By S. DEPINNA, B. C. CAVENETT, I. G. AUSTIN, T. M. SEARLE, M. J. THOMPSON, J. ALLISON and P. G. LE COMBER	473
Characterization of radiative recombination in amorphous silicon by optically detected magnetic resonance: Part II By S. DEPINNA, B. C. CAVENETT, T. M. SEARLE and I. G. AUSTIN	501
Electrical transport properties and phase stability of amorphous $\text{Cu}_x\text{Sn}_{1-x}$ alloys By J.-F. GENY, G. MARCHAL, PH. MANGIN, CHR. JANOT and M. PIECUCH	515
Grain-boundary flux pinning by the electron-scattering mechanism By W. E. YETTER, D. A. THOMAS and E. J. KRAMER	523
Correspondence:	
Magneto-oscillations in dislocation drag at low temperatures By L. R. MOTOWILDO, P. D. GOLDMAN and J. M. GALLIGAN	539
Book reviews	545

NUMBER 6—DECEMBER

PART A

Announcement

Creep and diffusion. Transitory creep and equilibrium kinetics of population of point defects in Co_{1-x}O By A. DOMINGUEZ-RODRIGUEZ, C. MONTY and J. PHILIBERT	869
Cyclic deformation of Nb single crystals. III. Temperature and strain-rate dependence of the cyclic flow stress By F. GUIU and M. ANGLADA	881
Observation d'un réseau de paraboles focales sous cisaillement dans un smectique A Par P. OSWALD, J. BÉHAR et M. KLÉMAN	899

PAGE

The defect structure of Te-doped GaAs after zinc diffusion By R. K. BALL, P. W. HUTCHINSON and P. S. DOBSON.....	915
Enhanced diffusion of oxygen during internal oxidation of nickel-base alloys By D. P. WHITTLE, Y. SHIDA, G. C. WOOD, F. H. STOTT and B. D. BASTOW	931
The dislocation geometry of interphase boundaries By K. M. KNOWLES.....	951
Modèle simple d'évolution de la microstructure des solides sous irradiation Par P. VALENTIN et G. MARTIN.....	971
Phase stability and microstructural characteristics of bulk glassy CdGe_{1-x}Si_xAs₂ alloys By A. P. BHATTACHERJEE and S. H. RISBUD.....	995
Correspondence:	
High-resolution real-time X-ray topography of dislocation generation in silicon By SHIH-LIN CHANG, H.-J. QUEISSER, H. BAUMGART, W. HAGEN and W. HARTMANN	1009
Lead on graphite: equilibrium shape, crystal growth, melting and the early stages of oxidation By J. J. METOIS, G. D. T. SPILLER and J. A. VENABLES.....	1015
Announcement	1023
Subject index	1025
Index of authors (with titles)	1031
Book review index	1041

PART B

Announcement	
Glass transition and molecular motions in the glassy state of a nematic liquid By G. P. JOHARI	549
Transmission electron microscopy of single-phase Co₅Sm permanent magnets By J. FIDLER	565
Kinetics of distant-pair recombination. I. Amorphous silicon luminescence at low temperature By D. J. DUNSTAN.....	579
N.M.R. study of changes in bonding and the metal-non-metal transition in liquid caesium-antimony alloys By R. DUPREE, D. J. KIRBY and W. FREYLAND	595

	PAGE
Compton profile of polycrystalline β-SiC	
By D. P. MAHAPATRA and H. C. PADHI	607
Recrystallization of buried amorphous layers and associated electrical effects in P^+-implanted Si	
By D. K. SADANA, J. WASHBURN and G. R. BOOKER	611
Asymptotic interaction between similar point defects in a free-electron gas	
By J. KHALIFEH and F. GAUTIER	635
Bipolaron and single-polaron contributions to a.c. conduction in r.f. sputtered SiO_2 films	
By R. MEAUDRE and M. MEAUDRE	647
Surface conduction versus bulk conduction in pure stoichiometric NiO crystals	
By M. A. WITTENAUER and L. L. VAN ZANDT	659
Correspondence:	
The K absorption edges of magnesium and aluminium	
By M. H. HEINONEN and J. A. LEIRO	669
Effect of a magnetic field on the transport coefficients of a system of electrons	
By W. JONES	675
Book reviews	679
Announcement	683
Subject index	685
Index of authors (with titles)	691
Book review index	701